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Indian Standard

INDUCTOR AND TRANSFORMER CORES FOR TELECOMMUNICATIONS

Sectional Specification : Magnetic Oxide Cores for Transformers and Chokes for Power Applications

भारतीय मानक

दूरसंचार के लिये प्रेरक और ट्रांसफार्मर कोर

समूहगत विशिष्टि : पावर अनुप्रयोगों के लिये ट्रांसफार्मरों और चोकों के लिये चुम्बकीय कोर

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INDUCTOR AND TRANSFORMER CORES FOR TELECOMMUNICATIONS

Sectional Specification: Magnetic Oxide Cores for Transformers and Chokes for Power Applications

National Foreword

This Indian Standard, which is identical with IEC Pub 723-4 (1987)/QC 250300 'Inductor and transformer cores for telecommunications: Part 4 Sectional specification: Magnetic oxide cores for transformers and chokes for power applications', issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on 24 November 1988 on the recommendation of the Magnetic Components and Ferrite Materials Sectional Committee (LTDC 13) and approval of the Electronics and Telecommunication Division Council.

Wherever the words 'International Standard' appear, referring to this standard, it should be read as 'Indian Standard'.

This standard is intended primarily for use under the IECQ System. A regular Indian Standard for this component could be different, identical or similar to this standard.

Cross Reference

In this Indian Standard, the following International Standards are referred to. Read in their respective places the following:

International Standard	*Corresponding Indian Standard*
IEC Pub 205 (1966) Calculations of the effective parameters of magnetic piece parts	IS 7616: 1974 Guide for calculation of the effective parameters of magnetic piece parts (*Technically equivalent*)
IEC 226 (1976) Dimensions of cross cores (X-cores) made of ferromagnetic oxides and associated parts	IS 7489 : 1974 Dimensions ot cross-cores (X-cores) made of ferromagnetic oxides and associated parts (*Technically equivalent*)
IEC Pub 647 (1979) Dimensions of magnetic oxide cores intended for use in power supplies (EC-cores)	IS 9652:1980 Dimensions for magnetic oxide cores and associated coil formers for use in power supplies (EC-cores) (*Technically equivalent*)
IEC Pub 723-1 (1982) Inductor and transformer cores for telecommunications: Part 1 Generic specification	IS QC 250000 : 1988/IEC QC 250000 : 1982 Inductor and transformer cores for telecommunications: Generic specification (*Identical*)
IEC Pub 723-4-1 (1986) [QC 250301 (1987)] Inductor and transformer cores for telecommunications: Part 4 Blank detail specification: Magnetic oxide cores for transformers and chokes for power applications – Assessment level A	IS QC 25031-1989/[IEC QC 25031 (1987)) Inductor and transformer cores for telecommunications–Blank detail specification: Magnetic oxide cores for transformers and chokes for power applications – Assessment level A (*Identical*)

The Technical Committee responsible for the preparation of this standard has reviewed the provisions of the following IEC Standards and has decided that these are acceptable for use in conjunction with this standard:

IEC Pub 68-1 (1982) Basic environmental testing procedures, Part 1 general

IEC Pub 68-2-1 (1974) Basic environmental testing procedures, Part 2 Tests - Test A cold

IEC Pub 68-2-2 (1974) Basic environmental testing procedures, Part 2 Tests - Test B dry heat

IEC Pub 133 (1985) Dimensions for pot-cores made of ferromagnetic oxides and associated parts

IEC Pub 367-1 (1982) Cores for inductors and transformers, Part 1 Measuring methods

IEC Pub 367-2 (1974) Cores for inductors and transformers for telecommunications, Part 2 Guide for the drafting of performance specifications

IEC Pub 367-2A (1976) First supplement to Pub 367-2 (1974)

IEC Pub 424 (1973) Guide to the specification of limits for physical imperfections of parts made from magnetic oxides

IEC Pub 431 (1983) Dimensions for square cores (RM-cores) made of magnetic oxides and associated parts

IEC Pub 525 (1976) Dimensions of toroids made of magnetic oxides or iron powder

Only the English language text in the International standard has been retained and French language text has been dropped while adopting it in this Indian Standard.

SECTION ONE – SCOPE

1. Scope

This sectional specification lists the characteristics, ratings and also the inspection requirements for magnetic oxide cores of assessed quality for transformers and chokes for power applications intended for professional and industrial applications, excluding broad-band and tuned transformers and mains frequency power transformers. It selects from the generic specification, IEC Publication 723-1, and from the basic specification, IEC Publication 367-1, the appropriate methods of test to be used in detail specifications derived from this specification, in accordance with the corresponding blank detail specification.

SECTION TWO – GENERAL

2. General

2.1 *Related documents*

IEC Publications:

Publications Nos. 68-1 (1982):	Basic Environmental Testing Procedures, Part 1: General and Guidance.
68-2-1 (1974):	Part 2: Tests — Test A: Cold
68-2-2 (1974):	Part 2: Tests — Tests B: Dry Heat.
133 (1985):	Dimensions of Pot-cores Made of Magnetic Oxides and Associated Parts.
205 (1966):	Calculation of the Effective Parameters of Magnetic Piece Parts.
226 (1967):	Dimensions of Cross Cores (X-cores) Made of ferromagnetic Oxides and Associated Parts.
367-1 (1982):	Cores for Inductors and Transformers for Telecommunications, Part 1: Measuring Methods.
367-2 (1974):	Part 2: Guides for the Drafting of Performance Specifications.
424 (1973):	Guide to the Specification of Limits for Physical Imperfections of Parts Made from Magnetic Oxides.
431 (1983):	Dimensions of Square Cores (RM-cores) Made of Magnetic Oxides and Associated Parts.
525 (1976):	Dimensions of Toroids Made of Magnetic Oxides or Iron Powder.

647 (1979):	Dimensions for Magnetic Oxide Cores Intended for Use in Power Supplies (EC-cores).
723-1 (1982): [QC 250000]	Inductor and Transformer Cores for Telecommunications, Part 1: Generic Specification.
723-4-1 (1986): [QC 250301]	Part 4: Blank Detail Specification: Magnetic Oxide Cores for Transformers and Chokes for Power Applications— Assessment Level A.

2.2 *Classification*

A core is classified by:

a) shape: e.g. E core, EC core, RM core...

Note. — U cores are also used for power applications, although their dimensions have not been standardized internationally.

b) size: e.g. E55/21, EC 41, RM 14...

c) class or material grade (combined electrical and magnetic properties): Since no systematic classification of the electromagnetic properties is available in the IEC, each detail specification shall clearly define the class or material grade to which it applies. It may also state the appropriate class designation.

Normally, a detail specification will cover cores of one shape, size and class.

SECTION THREE — QUALITY ASSESSMENT PROCEDURES

3. **Quality assessment procedures**

3.1 *Formation of inspection lots and test methods*

3.1.1 Where applicable the tests shall be selected from those given in Section Four of IEC Publication 723-1. Where additional tests are needed, they shall be described in the detail specification.

3.1.2 Visual and mechanical examination shall be carried out either on half cores prior to pairing or on sets (see note). All other tests shall be carried out on sets. (See also Sub-clause 3.4).

Note. — A set is a pair of core halves.

3.1.3 The test coils for amplitude permeability or flux density and those for total core loss measurements shall be fully defined; this may be fulfilled by reference to a national or international standard.

3.1.4 Cores consisting of more than one part shall be clamped together in accordance with the requirements of Clause 4 of IEC Publication 367-1. The value of the clamping force shall be specified in the detail specification.

Note. — Where it would be helpful to include such information, the detail specification may include details of the application of the clamping force (see, for example, the appendix of IEC Publication 367-2).

3.1.5 If an inspection lot consists of cores of more than one inductance factor, the number of specimens in the sample of each inductance factor shall be approximately proportional to the number of cores of each A_L value in the lot.

3.2 *Inspection for qualification approval*

3.2.1 When it is desired to obtain qualification approval by adopting the fixed sample size procedure (see Clause 8 of IEC Publication 723-1) use shall be made of the test schedule given in Sub-clause 3.3 of this specification. The details of the tests are as specified in the quality conformance test schedule (see Sub-clause 3.4). When the blank detail specification contains tests not included in the fixed schedule of Sub-clause 3.3, these shall be added either in the appropriate group or in one or more additional groups, and the total number of specimens (Group 0) shall be adjusted accordingly.

3.2.2 When the detail specification covers more than one inductance factor, the sample for qualification approval shall include approximately equal quantities of the highest value, the lowest value and a value near the middle of the range for which approval is sought. As a general guide, the sample for each group (1, 2, etc.) for qualification approval shall be equivalent to the corresponding group of the quality conformance test schedule and shall allow acceptance when one defective occurs in the sample. The sample size for group 0 shall be the sum of the sample sizes of the other groups plus two specimens to replace one possible defective in group 0 and one due to mishandling.

3.3 *Fixed sample size qualification approval test schedule*

The following sample size shall be used for carrying out qualification approval tests.

For test conditions and other details see Sub-clause 3.4 of this specification and Table I of the appropriate blank detail specification (as in IEC Publication 723-4-1). Each specimen in the following schedule shall be a set.

Group 0 28 specimens 1 defective allowed

12.1 Visual examination

12.2 Marking

12.3 Primary dimensions

17. Amplitude permeability or flux density

11.2 Total core loss

Group 1 13 specimens 1 defective allowed

12.4 Secondary dimensions

13.3 Inductance factor

14.1 Compressive strength

Group 2 13 specimens 1 defective allowed

13.12 Influence of a static magnetic field (if prescribed in the detail specification).

3.4 *Quality conformance inspection*

The following characteristics shall be included as a minimum in all blank detail specifications and for all assessment levels:

3.4.1 *Physical*

a) visual examination;

b) marking;

c) dimensions (primary and secondary).

Note. — *Primary* dimensions are the dimensions controlled by the gauge(s) defined in the appropriate IEC publication, for example, for EC cores: IEC Publication 647.
Secondary dimensions are all those dimensions shown in the appropriate IEC publication but not controlled by the gauge(s).

3.4.2 *Electrical*

Specify clamping force and test coils for electrical measurement.

a) Inductance factor A_L

Test in accordance with the requirements of Sub-clause 13.3 of the generic specification of IEC Publication 723-1.

Specify peak effective flux density $\hat{B}_e$.

Specify temperature θ and frequency f.

b) (Effective) amplitude permeability μ_a for a specified peak flux density $\hat{B}$; or peak flux density $\hat{B}$ for a specified peak field strength $\hat{H}$

Test in accordance with the requirements of Clause 17 of IEC Publication 367-1.

Specify temperature θ and frequency f.

Note. — $\hat{B}$ is calculated using the effective area A_e.

c) Total core loss

Test in accordance with the requirements of Sub-clause 11.2 of IEC Publication 367-1.

Specify peak flux density $\hat{B}$, temperatures θ_1 and θ_2, frequency f_1, and, if required, frequency f_2.

Note. — $\hat{B}$ is calculated using the effective area A_e.

d) Influence of a static magnetic field (if applicable)

Test in accordance with the requirements of Clause 15 of IEC Publication 367-1.

Specify direct current I_0, peak effective flux density $\hat{B}_e$ and frequency f.

3.4.3 *Mechanical*

a) Compressive strength

Test in accordance with the requirements of Sub-clause 14.1 of the generic specification of IEC Publication 723-1.

SECTION FOUR — ADDITIONAL INFORMATION

4. Additional information

Additional information, relating to the application of these cores, in the form of curves, graphs, typical values, etc., may be included or given separately by the manufacturers. This is supplied for information only and shall not be used for inspection purposes.

SECTION FIVE — BLANK DETAIL SPECIFICATION

5. Blank detail specification

The following information and requirements shall be included in each detail specification, together with the required values:

5.1 *Identification of the specification*

The identification of the detail specification shall include:

a) the name of the national standards organization under whose authority the detail specification is issued;

b) the number of the IEC blank detail specification used;

c) the number and issue status of the national generic specification;

d) the national number of the detail specification, date of issue and any other information required by the national system.

5.2 *Identification of the core*

The identification of the core shall include:

a) shape and size of the core, for example, core EC 41;

b) a short description of the class or material grade;

c) an outline drawing and dimensions, stating the dimensions in millimetres and indicating which are the primary dimensions (see note to Sub-clause 3.4.1). When the dimensions are in accordance with those published in an IEC standard, this shall be stated;

d) the application or group of applications, and an indication of the quality assessment level;

e) reference data giving information on the most important properties of the core, which allow comparison between the various core types intended for the same or for similar applications. These include, but are not limited to:

- effective parameters, see Clause 5 of IEC Publication 723-1;
- operating conditions, see sub-clause 5.3.1 below;
- storage conditions, see Sub-clause 5.3.2 below.

5.3 *Limiting conditions (not for inspection purposes)*

5.3.1 *Operating conditions*

Any mechanical, environmental or electrical conditions which may cause damage to the core, or which may cause certain parameters to exceed the specified limits, shall be stated, for example:

- temperature range within which the specified amplitude permeability is valid (see Item *b)* of Sub-clause 3.4.2), for example +10 °C to +55 °C.

Note. – For standard temperatures, see IEC Publication 68-2-1 and 68-2-2.

5.3.2 *Storage conditions*

The environmental conditions shall be stated for the ferrite cores alone, for example:

−55 °C to +100 °C.

5.4 *Marking*

5.4.1 *Core sets*

The following shall be marked as a minimum on each core or on one half of a set of cores:

- class or grade of material (may be in coded form).

Where space permits, the following shall also be marked on each core:

- manufacturer's trade mark;
- inductance factor A_L in nH; or, where applicable, the air gap.

When writing the detail specification, it shall be decided what marking shall be included on the core.

5.4.2 *Core package*

The following shall be marked as a minimum on the core package, in the order given:

a) detail specification reference number;
b) manufacturer's name or trade mark;
c) manufacturer's component designation;
d) inductance factor in nH, or air gap;
e) lot identification;
f) quantity.

Any additional marking shall be so applied that no confusion can arise.

5.5 *Ordering information*

The detail specification shall indicate that the following information is required when ordering cores:

a) detail specification reference number;
b) manufacturer's component designation;
c) inductance factor in nH, or air gap;
d) quantity required;
e) further information required by the manufacturer to identify the product.

5.6 *Related documents*

IEC Publication 723-4 (this sectional specification) or its national equivalent, together with any other IEC standard (or its national equivalent) needed to implement the detail specification, if not included in the above, for example, the number with issue status and date and the title of a dimensional standard for the core and/or test coils.

5.7 *Additional specifications or test details*

Where it is inconvenient to provide details in the test inspection schedule, the requisite information should be given separately. If an appendix is used for this procedure it shall be suitably referenced.

5.8 *Certified test records (CTRs)*

Whether required or not.

When required the CTR shall comply with Clause 11 of IEC Publication 723-1.